VECTRIX™

A Look Back!

The Year was 1996

SolarMax (Sarasota,FL)

+

Boston Capital Ventures (BCV)

↓

Concept of the “Breeze” bike: Motor/Gearbox in Rear Wheel

Lockheed Martin (Marietta,GA)

+

Investec Strategies (Newport,RI)

↓

Identified Electric Scooters as a business opportunity

→ BCV bought out SolarMax & retained Investec Strategies to manage a new venture named The Breeze Acquisition Company (BAC)

Mid 1996

- The “Breeze” concept started to be engineered in the SolarMax Facility in Sarasota, FL
  - Jordan Gay chief engineer + 1 CAD person
- Investec expanded the development team
  - Windigo (Morristown,NJ): Vehicle Controls & Battery Management
  - Lockheed Martin (Marietta,GA): Structure/Frame
  - Kollmorgen (Blacksburg,VA): Motor & Controller
  - Getrag Gears of NA (Charlotte,NC):Gearbox
  - Richard Moore (Atlanta,GA): Experienced test rider
- The Investors became dissatisfied with the engineering progress

January/February 1997

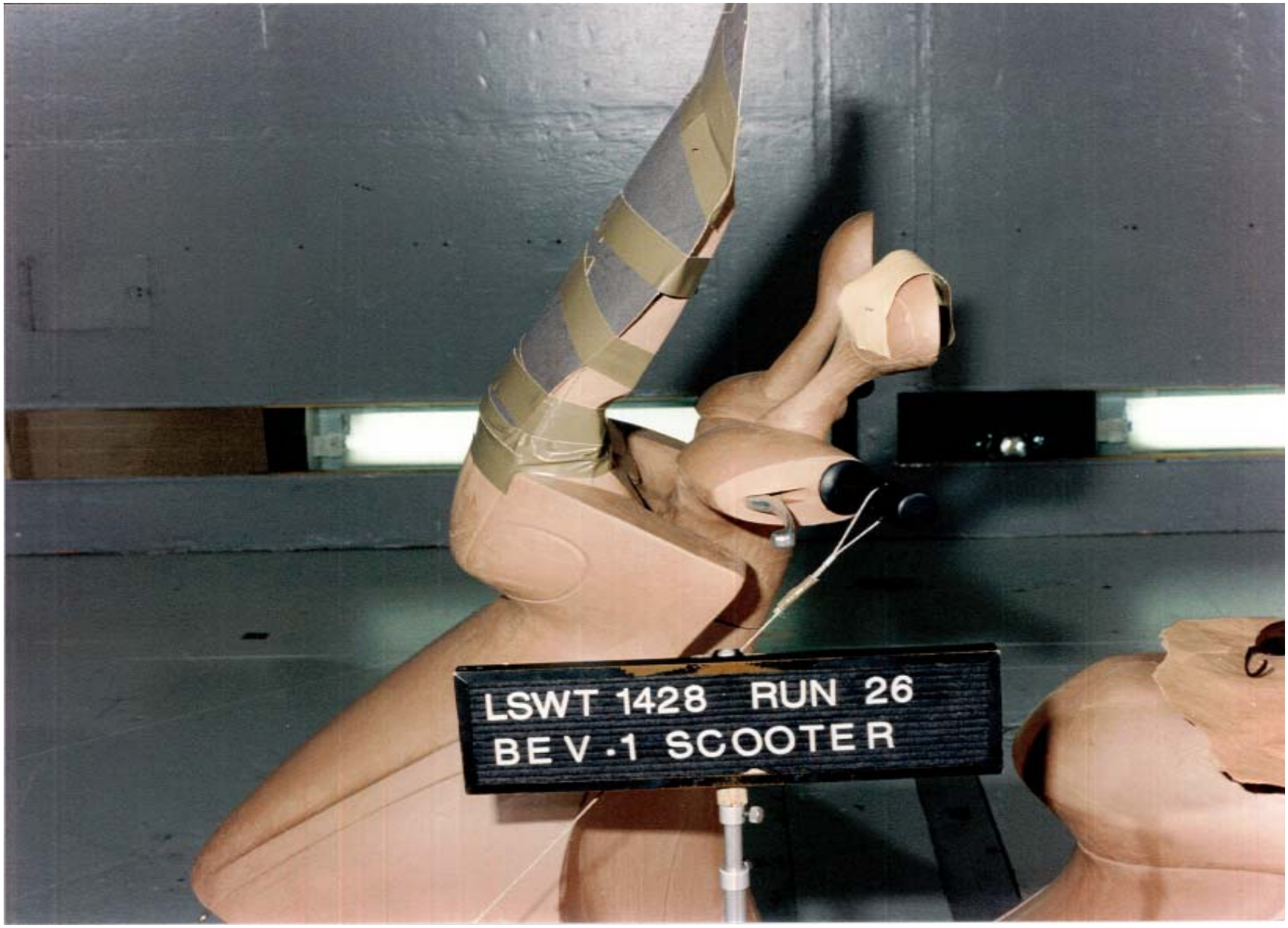
- Cox & Hughes brought aboard
- Design documentation + intellectual property extracted from SolarMax and relocated to Lockheed in Marietta,GA
- Steve Cox establishes a workshop in Middleton,RI
- Peter Hughes establishes an engineering team within Lockheed facility
  - Dan Baldwin → Lockheed Structural Engineer
  - Contracted CAD & Engineers
  - Richard Moore as Rider Consultant
- First introduction to Robrady Studio simply by accident since it was next door to SolarMax

Initial Product Features

- Max-Scooter Target Market
- 16” Rear Wheel/Gearbox
- 2 Piece Cast Aluminum Frame
- 72 Volt Hawker Genesis SLA Battery Pack
- Dual Motor Windings
- Dual Motor Drives/Controllers
- No Clear Concept for Regen Braking Control

Progress in 1997

- Full Clay Model Built
- Wind Tunnel Testing @ Lockheed July 1997
- The “White Whale” is born
  - First rolling prototype
  - Motor Drive destroyed within 24 hours of rollout
  - Kollmorgen flies parts in from Blacksburg,VA
  - Next morning bike rolls out at the Newport,RI Marriott Hotel
  - $100K collected from parking lot demo
- Two demo bikes with bodywork assembled by Steve Stringer in Crockett,TX
- Bikes painted in a truck while in transit to EVS-14 in Orlando,FL
- Vectrix is only EV operational in the rain @ EVS-14



Clay Model

Wind Tunnel Testing

Wind Tunnel Testing

VECTRIX

ADVANCED TRANSPORTATION SOLUTIONS

Specifications

FULFILLING THE PROMISE OF EV TECHNOLOGY.

Brochure @ EVS - 14

VECTRIX

ADVANCED TRANSPORTATION SOLUTIONS

Electric Scooter Specifications

DESCRIPTION

2-passenger electrically-powered large category scooter

DIMENSIONS

overall:	l: 2.0 m w: 59.0 cm
wheel base:	1.43 m

PERFORMANCE SPECIFICATIONS

acceleration:	0-50 km/h, 3.7 sec 0-80 km/h 6.2 sec 0-30m, 3.9 sec 0-60m, 5.5 sec 0-100m, 7.4 sec
top speed:	100 km/h
range (single charge):	118 km @30 km/h 98 km @40km/h 89 km @45 km/h 79 km @50km/h

DESIGN FEATURES

recharge time:	6 - 8 hrs 30 - 45 min for 60% capacity
frame:	Lightweight cast aluminum alloy
controls:	Digital electronics/instruments
storage:	Fully enclosed, locking trunk (full size helmet/soft briefcase)

PRIMARY FEATURES AND COMPONENTS

drive system:	Permanent magnet, brushless, DC, motor with 3-Phase winding 65 Nm Torque (peak) 22.5 Nm Torque (continuous) Digital Signal Processing (DSP), Pulse Width Modulation (PWM) Rheostat throttle
transmission:	Single stage planetary gear, integrated "in-the-rear-wheel" Material: Cast aluminum alloy Gear ratio: 6.15:1
power supply & on-board systems:	120 VDC nominal 10, 12V 26Ah Genesis® sealed lead batteries Self diagnostics & battery monitoring Regenerative braking 110V AC 12A battery charger

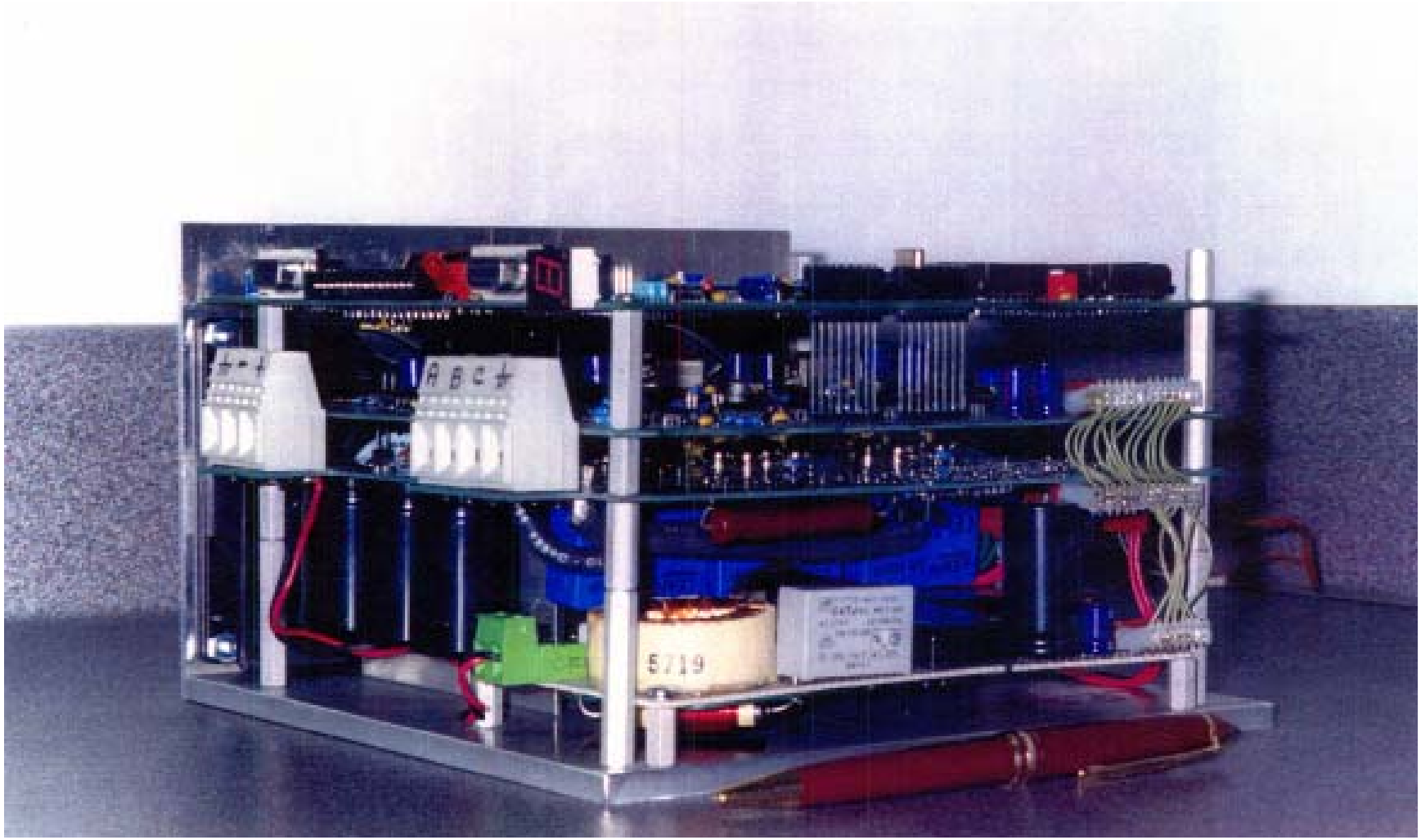
VECTRIX CORPORATION

for business inquiries:
Seventy-eight Thames Street Newport, Rhode Island 02840
tel 401 848 9993 fax 401 848 9994

for product information:
Ninety-seven Cove Street New Bedford, Massachusetts 02744
tel 508 992 5300 fax 508 992 6252

Preliminary information. All data is subject to change without notice.

Fabricated Frame & Batteries



Kollmogen Motor Controller

Two Motor Controllers

Demonstration Scooter Configurations

emo Scooter Number	Frame Type	Body Panels	Lights	Rear Wheels	FrontWheels	Brake Rotors	Front Fork	Battery Charger	Application	Need Date	Notes
Show T1	Fab #4	1st Set AAD	CEV Clones	Fabricated	Fabricated	Brembo	Marzocchi Mod	External	Body Plug & NB Testing	4/1/98	
T2	Fab #2	2nd Set AAD	CEV Clones	Fabricated	Fabricated	Brembo	Marzocchi Mod	External	EVS Ride/Atlanta Test Bike	N/A	
T3	Fab #3	3rd Set AAD	CEV Clones	Fabricated	Fabricated	Brembo	Marzocchi Mod	External	Andy's Fully Detailed Bike	2/20/98	
Test Article	Cast #1	None	None	None	None	None	None	None	Frame Fatigue Test Article	3/30/98	
Body Master Frame	Cast #2	None	None	None	None	None	None	None	Body Master Frame	3/30/98	
T4	Cast #3	None	None	Cast	Cast	Eck Cast Al	Variety of Marzo	External	NB Engineering Dev Testing	4/15/98	Initiate CEV Light Tooling
T5	Cast #4	None	None	Cast	Cast	Brembo	Marzocchi	External	Scooter Handling Tests	4/30/98	
F1	Cast #5	Fiberglas	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #1	6/1/98	
F2	Cast #6	Fiberglas	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #2	6/15/98	
F3	Cast #7	Fiberglas	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #3	6/30/98	ECK 1st Lot of 7, Original Desi
F4	Cast #8	Fiberglas	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #4	7/15/98	
F5	Cast #9	Fiberglass	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #5	7/15/98	
F6	Cast #10	Fiberglas	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #6	7/30/98	
F7	Cast #11	Fiberglas	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #7	7/30/98	
F8	Cast #12	Hybrid Formed	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #8	8/15/98	
F9	Cast #13	Hybrid Formed	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #9	8/15/98	
F10	Cast #14	Hybrid Formed	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #10	8/30/98	ECK 2nd Lot of 7 with Tool Mo
F11	Cast #15	Hybrid Formed	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #11	8/30/98	
F12	Cast #16	Hybrid Formed	Off The Shelf	Cast	Cast	Brembo	Marzocchi	On Board	Fleet Scooter #12	8/30/98	Freeze Design 9/1/98
M1	Cast #17	Hybrid Formed	CEV Custom	Cast	Cast	Brembo	Marzocchi	On Board	Marketing Scooter #1	9/15/98	Production Tooling Release 9/1/
M2	Cast #18	Hybrid Formed	CEV Custom	Cast	Cast	Brembo	Marzocchi	On Board	Marketing Scooter #2	9/15/98	
M3	Cast #19	Hybrid Formed	CEV Custom	Cast	Cast	Brembo	Marzocchi	On Board	Marketing Scooter # 3	9/30/98	
M4	Cast #20	Hybrid Formed	CEV Custom	Cast	Cast	Brembo	Marzocchi	On Board	Marketing Scooter #4	9/30/98	ECK 3rd Lot of 6 with Final Mo

- Circa 2000/2001: Vectrix attempts to license EV Technology to existing gas scooter companies
  - Benelli – Aprilia – Peugeot – Piaggio – Ducati – Honda – Yamaha
- October 2001: First Vectrix/GP Meeting Toronto,Canada
- December 4,2001: Hybrid Patent Issued
- June 2002: First GP NiMH battery pack delivered to Vectrix
- 2003: Parker pays $1M for 50% ownership of hybrid patent
- June 2003: Parker Meeting in New Bedford with 12 divisions vying for Vectrix business
  - Motor – SBC Division
  - Motor Controller – Compumotor Division
- August 2003: Vectrix evaluates M. Caetano in Agueda, Portugal as a manufacturing partner. Driven by Lockheed offset program. 8 – P Bikes produced 12/03

Pat Parker in France

Pat Parker – Cleveland,OH

Battery Selection Tradeoffs

		Battery Pack Rating @ 120V		
	Technology	**NiMH**	**NiZn**	**SLA**
Features	Vendor	Gold Peak	Evercel	Hawker
	Vendor Reliability	High	Low	High
	Charging Temp Sensitivity	Tolerant	Tolerant	Poor @ Lo Temp
	Low Temp Performance	Excellent	Excellent	Poor
	Characteristic	30Ah	30Ah	26Ah
	OnBoard Energy Storage (kWh)	3.7	3.5	3.1
	Battery Pack Weight (kg)	82	84	100
	Vehicle Weight (kg)	198	200	216
Range	Range @ 40km/hr (km)	101.0	92.5	84.4
	Range @ 80km/hr (km)	60.0	55.0	35.0
	Cycle Life	1,700	600	400
	Lifetime Range (km)	136,850	44,250	23,880
	Cycle Life in Years (20km/day avg.	19.0	6.1	3.3
Cost	Cost per kWh	**$ 500**	**$ 283**	**$ 167**
	Battery Pack Cost	$ 1,850	$ 980	$ 520
	Battery Cost/Cycle	$ 1.09	$ 1.63	$ 1.30
	Cost per km	**$ 0.014**	**$ 0.022**	**$ 0.022**

PROPRIETARY & CONFIDENTIAL

T-Bike Series

Vectrix Prototype Fleet Status

Scooter	Description	Frame	Motor	Gearbox	Batteries	Current Location	Application
T13	Red Bike	Fab in line	12 pole	13"	30Ah, Ni-MH	New Bedford	Testing / Demonstration
T12	Blue Bike	Fab in line	12 pole	13"	30Ah, Ni-MH	Bologna, Italy	Demonstrations
T11	Green Bike	Fab in line	12 pole	13"	26Ah, SLA	Bologna, Italy	Demonstrations
T9	Black Bike	Fab in line	12 pole	13"	30Ah, Ni-MH	New Bedford	Testing / Demonstration
T6	Engineering Development	2 piece cast	16 pole	16"	16Ah, SLA	New Bedford	Electrical Systems Development
T2	Full Bodied Red Bike	Old fab	12 pole	16"	26Ah, SLA	New Bedford	Demo Rides Only
T1	Dyno Bike	Old fab	12 pole	16"	Universal	New Bedford	Battery Testing / Evaluation
C-1 Retro	BMW	n/a	12 pole	13"	16Ah, SLA	Returned to BMW	BMW Evaluation

PROPRIETARY & CONFIDENTIAL

VECTRIX
THE FUTURE IN MOTION

Supply Chain

MEDALLION INSTRUMENTATION SYSTEMS
Instrument Pod

MAC
Battery Charger

MARZOCCHI PERFORMANCE SUSPENSION SYSTEMS
Front Fork

GENERAL FOUNDRY SERVICE
Aluminum Castings

PIRELLI
Tires

MINCO
Body Panel Tooling

ROBRADY design
Styling & Prototyping

brembo
Brake Disks & Calipers

inMetal
Frame Fabrication

Parker
Parker Divisione SBC – Motor

Parker Compumotor - Motor Controller

Parker Thermoplastics - Body Panels

Speaker
Lighting System

SACHS
Shock Absorbers

BRO Brault Research Organization
Lighting Tooling

GOLD PEAK
Battery Pack

FAI, INC.
Wiring Harnesses

desc
Gearbox

Webster Plastics

PROPRIETARY & CONFIDENTIAL

Vectrix Electric Scooter: PreProduction Prototypes

Scooter #	Description	Battery Pack	Frame	Motor	Electronic Control	Swingarms	Suspension	Battery Charger	Assembly Location	Ship To	Delivery Date
FC1	Fuel Cell Prototype	20 AH GP	Modify Existing	12 P Existing	Vectrix	Existing	Existing	None	Robrady	Miami & Long Beach	9/19/2003
P1	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Robrady	Miami & Long Beach	10/27/2003
P2	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Robrady	Miami & Long Beach	10/27/2003
P3	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Caetano	UK	11/10/2003
P4	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Caetano	Germany	11/10/2003
P5	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Caetano	UK	11/21/2003
P6	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Caetano	Germany	11/21/2003
P7	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Caetano	Italy	12/5/2003
P8	Electric	30 AH GP	Caetano	12P/18S Parker SBC	Parker CM	Vectrix	Caetano	Vectrix	Caetano	Caetano	12/5/2003

Notes:

1. FCI Ship from Robrady to Vectrix NB for fuel cell/battery intergration
2. FCI integrated with CEI display booth @ Vectrix NB
3. First two sets of components available September 30,2003 @ Robrady Studio. Two sets per week thereafter to Caetano facility in Portugal.
4. Vectrix to supply 13" gearboxes from stock

- April 2004: Polaris elects not to manufacture Vectrix bikes @ Spirit Lake, Iowa facility
- March 2005: Millbrook Performance and Range Testing with P4 & P8 bikes in UK
  - Max speed: 63 mph
  - NEDC Range Test: 32 miles
  - City Range Test: 38 miles
  - 40km/hr Range: 59 miles
- June 2005: Vectrix decides to manufacture bikes
- January 2006: New Bedford pilot facility assembly building complete
- January 31,2006 – April 2006: NB Pilot bike assembly
- April 2007: Wroclaw start of production

Financing Adventures

- AIM IPO aborted May 2005
- Bridge Loan $25M+
- Potential TPG $40M Investment Failed June 2006
- AIM IPO June 2007
  - RAB Capital the Lead Dog
  - HSBC Investment Bank
- May 2008 Mike Boyle becomes CEO
- July 13, 2009 Vectrix shuts its doors

NB Pilot Build Team

Pilot Bikes

Pilot Bikes

Wroclaw Assembly Line

Bike #1

First VIN

The First Born

Bike 1

Superbike @ EICMA

Superbike @ EICMA

ELECTRIC

EICMA Ride & Drive

EICMA Test Track

VECTRIX
ERBIKE
ECTRIC SUPERBI
ELECTRIC 3 W

Polizia Municipale

VX-3 Prototype

VX-3 Prototype

Boston Marathon

Crossing the Line